

Humans cause erosion one hundred times faster than normal

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Mar 05, 2015(Mongabay News: <http://news.mongabay.com> Delivered by Newstex) <nl/> Runoff from Hurricane Isabel floods the Potomac River at Great Falls, Va., carrying sediment eroded from farm fields upstream. Photo by: Paul Bierman.<nl/><nl/><nl/>

<nl/>Experts have long linked deforestation and intensive farming to worsening erosion rates around the world. Although studied extensively, determining erosion rates due to human-induced activities has rarely been quantified by scientists. However, new research conducted by geologists finds that erosion rates in the southeastern United States increased one hundred times after the arrival of European colonists in the 1700s due to tree clearing and unsustainable agriculture practices. <nl/><nl/>One of the researchers, Paul Biermann, a geologist from the University of Vermont, told mongabay.com that he has been studying erosion rates and landscape change ever since he came to Vermont and saw the dramatic human imprint on the landscape. <nl/><nl/>Bierman explained that there are two primary types of human activities that are responsible for increased soil erosion rates in the southeastern United States: 'the removal of the trees and thus their root systems which stabilize the soil on slopes and the advent of tillage agriculture which loosens the soil and makes it susceptible to water and wind erosion.'<nl/><nl/>In order to determine the impact of human activities on erosion rates, geologists had to first establish background (geologic) rates of erosion. They conducted research at ten large river basins (10,000-100,000 square kilometers) in the southern Appalachian piedmont region from Virginia to Alabama. These ten river basins sites all had a history of large-scale native forest clearing and intensive agriculture use starting in the 1700s and experienced maximum land use in the late 1800s and early 1900s. <nl/><nl/>The scientists collected 24 sediment samples from the ten river basins and then used quartz in the sediment to extract a rare form of the element beryllium, an isotope called beryllium-10 (10Be). Formed by cosmic rays, the isotope 10Be accumulates in the top layer of the soil. The greater the amount of beryllium-10 in the soil, the slower the rate of erosion since the soil is exposed at the Earth's surface for a longer period of time. <nl/><nl/>'10be allows us to see back in time, beyond the human impact to the natural rates of landscape change,' Bierman said. "These provide a benchmark against which to compare modern rates.'<nl/><nl/>The team measured the amount of 10Be in their sediment samples in order to estimate the geologic erosion rates prior to human-induced activities on the land. <nl/><nl/>University of Vermont geologists collecting river sand in a sieve. The quartz in the sand yields a rare isotope, beryllium-10, and the amount of beryllium can reveal rates of erosion on the surrounding landscape. Photo by: Joshua Brown.<nl/><nl/> The study concluded that the landscape in these 10 river basins had hillslope erosion rates of around eight meters per million years (m/m.y before European settlement (pre-1700s) and around 950 meters per million years (m/m.y.) following peak disturbance in the early 1900s, representing an increase of one hundred times the natural rate. Furthermore, the research found that the sediment yield increased five to ten percent above pre-settlement levels and rivers were only carrying about six percent of the eroded soil downstream while leaving the remainder at the base of the hillslopes and valley bottoms. <nl/><nl/><nl/><nl/>Unfortunately, such increased erosion rates lead to an array of environmental and economic consequences. <nl/><nl/>According to Bierman, increased erosion rates can result 'in gullyng the landscape due to turbid waters and the transport of metals and nutrients attached to sediment particles.' In addition, the economic impacts include the 'need for soil amendments such as fertilizer and the loss of land for use.' <nl/><nl/>Fortunately, erosion and sediment yields have

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stopped increasing in the areas surveyed by Bierman due to 'the implementation of modern farming and soil conservation techniques including no-till, contour plowing, crop rotation, and cover crops has dramatically reduced erosion rates.' <nl/><nl/>From 1967 to 1972, the sediment deposition in the reservoirs surveyed declined to a basin-wide erosion rate of approximately 10 meters per million years (m/m.y.). Since this erosion rate is in line with the natural erosion rates estimated (i.e., as indicated by the ¹⁰Be results) for the area, it suggests that soil conservation practices are effective at reducing erosion.<nl/><nl/>Bierman said the study is important to policy maker because it 'guides environmental policies and regulations with regards to soil conservation and land use planning.' Using the beryllium-10 erosion rates as a target for successful resource conservation strategies, Bierman states that 'we have set a benchmark rate of erosion to which regulators can compare current rates of soil loss and this allows rationale evaluation of policies and regulations to see if they are capable of reducing modern erosion rates to those characteristic of the area being regulated.'<nl/><nl/>Citations: <nl/><nl/> Reusser, Paul, Bierman, Paul and Rood, Dylan 2015. Quantifying human impacts on rates of erosion and sediment transport at a landscape scale. Geology published online; doi: 10.1130/G36272.1<nl/><nl/><nl/><nl/><nl/><nl/><nl/><nl/><nl/><nl/>Please enable JavaScript to view the comments powered by Disqus.[1] blog comments powered by Disqus[2]<nl/><nl/><nl/><nl/> Related articles<nl/><nl/><nl/> http://news.mongabay.com/2012/0711-mountain-roads.htmlProliferation of mountain roads a hazard to the environment in SE Asia<nl/> (07/12/2012) Mountain roads in rural Southeast Asia are providing market access for remote communities but causing significant environmental harm, including deforestation, landslides, and soil erosion, sometimes undermining the benefits they offer, warns a commentary published in Nature Geoscience.<nl/><nl/> <nl/>http://news.mongabay.com/2011/0926-agua_salud_stri.htmlPanama canal drives forest conservation, offers insight on value of ecosystems<nl/> (09/26/2011) As demonstrated by growing enthusiasm for conserving forests and the rise of the Reducing Emissions from Deforestation and Degradation (REDD+) program, the public is increasingly aware of the role forests play in delivering ecosystems services — like clean air and water — that benefit mankind. Yet, science still lags conventional wisdom — researchers have yet to fully quantify much of what healthy forests provide. Bridging this gap is key to unlocking the full value of protecting and restoring tropical forests. The ambitious Agua Salud Project in Panama is attempting to do just that. <nl/><nl/> <nl/>http://news.mongabay.com/2011/0512-hance_china_slcp.htmlReforestation program in China preventing future disasters <nl/> (05/13/2011) China's response to large-scale erosion with reforestation is paying off according to a study in the Proceedings of the National Academy of Science (PNAS). The 10-year program, known as Sloping Land Conversion Program (SLCP), is working to turn some 37 million acres back into forest or grasslands after farming on steep slopes in the Yangtze and Yellow River basins had made them perilously susceptible to erosion and flooding. <nl/><nl/> <nl/>http://news.mongabay.com/2011/0422-hance_earthday_ecology.htmlWhat does Nature give us? A special Earth Day article<nl/> (04/22/2011) There is no question that Earth has been a giving planet. Everything humans have needed to survive, and thrive, was provided by the natural world around us: food, water, medicine, materials for shelter, and even natural cycles such as climate and nutrients. Scientists have come to term such gifts 'ecosystem services', however the recognition of such services goes back thousands of years, and perhaps even farther if one accepts the caves paintings at Lascaux as evidence. Yet we have so disconnected ourselves from the natural world that it is easy—and often convenient—to forget that nature remains as giving as ever, even as it vanishes bit-by-bit. The rise of technology and industry may have distanced us superficially from nature, but it has not changed our reliance on the natural world: most of what we use and consume on a daily basis remains the product of multitudes of interactions within nature, and many of those interactions are imperiled. Beyond such physical goods, the natural world provides less tangible, but just as important, gifts in terms of beauty, art, and spirituality.<nl/> [1]: http://disqus.com/?ref_noscript [2]: http://disqus.com

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